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24978 7590 08/06/2009

GREER, BURNS & CRAIN
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CHICAGO, IL 60606

EXAMINER

KASRAIAN, ALLAHYAR

ART UNIT

PAPER NUMBER

2617

DATE MAILED: 08/06/2009

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/525,696

08/04/2005

Rene L. Cruz

0321.68263

7642

TITLE OF INVENTION: SCHEDULING METHODS FOR WIRELESS NETWORKS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	11/06/2009

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24978 7590 08/06/2009

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Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/525,696 08/04/2005 Rene L. Cruz 0321.68263 7642

TITLE OF INVENTION: SCHEDULING METHODS FOR WIRELESS NETWORKS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
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nonprovisional YES \$755 \$300 \$0 \$1055 11/06/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
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KASRAIAN, ALLAHYAR 2617 370-318000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
- 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s); (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

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Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/525,696	08/04/2005	Rene L. Cruz	0321.68263	7642
24978	7590	08/06/2009	EXAMINER	
GREER, BURNS & CRAIN 300 S WACKER DR 25TH FLOOR CHICAGO, IL 60606			KASRAIAN, ALLAHYAR	
			ART UNIT	PAPER NUMBER
			2617	
DATE MAILED: 08/06/2009				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 716 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 716 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Notice of Allowability	Application No.	Applicant(s)	
	10/525,696	CRUZ ET AL.	
	Examiner	Art Unit	
	ALLAHYAR KASRAIAN	2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Applicant's supplemental after final amendment filed on 07/15/2009.
2. ☒ The allowed claim(s) is/are 1-4,6,7,11-17,20 and 24.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
 - * Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date ____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date ____ 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | <ol style="list-style-type: none"> 5. <input type="checkbox"/> Notice of Informal Patent Application 6. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date ____. 7. <input type="checkbox"/> Examiner's Amendment/Comment 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance 9. <input type="checkbox"/> Other ____. |
|---|--|

DETAILED ACTION

Remarks

1. The present Office Action is based upon the Applicant's After Final Amendment filed on 07/15/2009.

Allowable Subject Matter

2. **Claims 1-4, 6, 7, 11-17, 20 and 24** are allowed.
3. The following is an examiner's statement of reasons for allowance:

Consider **claim 1**, the best prior arts of record found during the examination of the present application, **Attar et al. (US Patent Application Pub. # 20040038697)** (hereinafter Attar) discloses a method for scheduling communication in a wireless communications network, the network having a plurality of nodes, the method comprising steps of:

 measuring channel parameters between arbitrary nodes in the wireless communications network (FIG. 1 par. 0041 and 0068);

 for each possible transmission mode, identifying a signal to interference plus noise ratio based upon the measured channel parameters (par. 0040, consider transmission mode as forward links from different access points);

 mapping the signal to interference plus noise ratio into a data rate for the transmission modes (par. 0041, 0043);

 from a subset of transmission modes that result from the step of mapping, determining which of all of the transmission modes are may be scheduled for one of to

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meet minimum data rate constraints between links and minimize total average power, or to maximize total throughput while meeting a maximum power constraint on each link in the network (par. 0029, 0040, 0043, 0078-0079, 0140, 0169-0172, 0178, the subset of transmission modes could be considered as forward/reverse link from access point 100 or 102 t/from access terminal 104).

However, Attar fails to specifically disclose, teach or suggest choosing path flows for routing communications through the links scheduled by said step of determining, wherein said step of choosing paths comprises:

- determining an initial set of path flows between sources and destinations, and calculating a data rate carried on each link of the network to define a set of data rates;

- for the set data rates, minimizing total power and calculating a resulting link sensitivity of the total power to a change in the data rate on each link to define calculated link sensitivity parameters;

- using the calculated link sensitivity parameters to produce adjusted path flows; re-calculating the carried data rate on each link for adjusted path flows, and

- recalculating the link sensitivity parameters; iteratively repeating, if necessary, said steps of adjusting and re-calculating until total power used is acceptably small.

Therefore, **claim 1 and its dependent claims 2-4, 6, 7, and 12-15** are considered novel, non-obvious and allowable.

Consider **claim 11**, the best prior arts of record found during the examination of the present application, **Attar et al. (US Patent Application Pub. # 20040038697)**

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(hereinafter Attar) in view of **Amadon et al. (US Patent # 7020147)** (hereinafter Amadon) where Attar discloses a method for scheduling communication in a wireless communications network, the network having a plurality of nodes, the method comprising steps of:

measuring channel parameters between arbitrary nodes in the wireless communications network (FIG. 1 par. 0041 and 0068);

for each possible transmission mode, identifying a signal to interference plus noise ratio based upon the measured channel parameters (par. 0040, consider transmission mode as forward links from different access points);

mapping the signal to interference plus noise ratio into a data rate for the transmission modes (par. 0041, 0043);

from a subset of transmission modes that result from the step of mapping, determining which of all of the transmission modes are may be scheduled for one of to meet minimum data rate constraints between links and minimize total average power, or to maximize total throughput while meeting a maximum power constraint on each link in the network (par. 0029, 0040, 0043, 0078-0079, 0140, 0169-0172, 0178, the subset of transmission modes could be considered as forward/reverse link from access point 100 or 102 t/from access terminal 104).

However, Attar fails teach or suggest said step of determining comprises application of a convex duality calculation.

In the same field of endeavor, Amadon discloses said step of determining comprises application of a convex duality calculation (col. 10, lines 21-33).

However, Attar as modified by Amadon fails to specifically disclose, teach or suggest wherein the convex duality calculation comprises: defining a numerical value for each transmission mode in the subset of transmission modes, wherein the numerical value is the sum of powers for each link plus a difference term for each link, and wherein each difference term is equal to a difference between a required minimum data rate on the link and an associated data rate on the link for a given transmission mode, and wherein difference terms summed in the numerical value are weighted in proportion to corresponding dual variables defined for each link; restating a modified optimization criteria defined as the smallest numerical value from said step of defining, over the set of transmission modes in the subset of transmission modes; determining optimal values for the dual variables which maximize the modified optimization criteria; determining a set of transmission modes whose associated numerical values achieve the minimum in the modified optimization criteria, wherein the dual variables are set to optimal values as determined in said step of determining optimal values.

Therefore, **claim 11** is considered novel, non-obvious and allowable.

Consider **claim 16**, the best prior arts of record found during the examination of the present application, **Attar et al. (US Patent Application Pub. # 20040038697)** (hereinafter Attar) discloses a method for scheduling communication in a wireless communications network, the network having a plurality of nodes, the method comprising steps of:

measuring channel parameters between arbitrary nodes in the wireless

communications network (FIG. 1 par. 0041 and 0068);

for each possible transmission mode, identifying a signal to interference plus noise ratio based upon the measured channel parameters (par. 0040, consider transmission mode as forward links from different access points);

mapping the signal to interference plus noise ratio into a data rate for the transmission modes (par. 0041, 0043);

from a subset of transmission modes that result from the step of mapping, determining which of all of the transmission modes are may be scheduled for one of to meet minimum data rate constraints between links and minimize total average power, or to maximize total throughput while meeting a maximum power constraint on each link in the network (par. 0029, 0040, 0043, 0078-0079, 0140, 0169-0172, 0178, the subset of transmission modes could be considered as forward/reverse link from access point 100 or 102 t/from access terminal 104).

However, Attar fails to specifically disclose, teach or suggest specifying a traffic matrix wherein each element in the matrix comprises a rate of data traffic to be moved between a transmitting node and a receiving node;

testing a candidate routing using the traffic matrix to induce a data rate on each link; scheduling according to said steps of measuring, identifying,

mapping and determining to determine transmission power and link sensitivity parameters indicating sensitivity of total power to changes in data rate on each link; iteratively searching for a routing to reduce average power.

Therefore, **claim 16 and its dependent claim 17** are considered novel, non-

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obvious and allowable.

Consider **claim 20**, the best prior arts of record found during the examination of the present application, **Zourntos et al. (US Patent Application Pub. # 20030100343)** (hereinafter Zourntos) discloses a method for routing information through a wireless communication network, the network having a plurality of nodes and a plurality of potential links between the nodes, the method comprising steps of:

determining a traffic matrix that specifies the rate of information transport between each pair of nodes in the network (par. 0289, 0196-0197);

setting an initial routing of traffic on said links of the network in order to support the traffic matrix determined in said step of determining a traffic matrix (FIG. 14, par. 0196-0197, 0205);

determining required data rates on the links of the wireless communication network for the initial routing of traffic set in said step of setting (par. 0196-0197, 0289, 0296);

computing a sensitivity of links in response to change of data rate (par. 0293, 0297, 0359);

iteratively adjusting the routing of traffic using the sensitivity of links so that the weighted sum of expended transmission powers across the links of the network is reduced and repeating said steps of determining and computing (par. 0257, 0267, 0414),

wherein said step of computing computes a sensitivity parameter for all links in

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the network (par. 0293, 0296, 0359).

However, Zourntos fails to specifically disclose, teach or suggest wherein the value of link sensitivity parameters are determined by steps comprising:

defining a numerical value for each transmission mode in the subset of transmission modes, wherein the numerical value is the sum of powers for each link plus a difference term for each link, and wherein each difference term is equal to a difference between a required minimum data rate on the link and an associated data rate on the link for a given transmission mode, and wherein difference terms summed in the numerical value are weighted in proportion to a dual variable defined for each link;

restating a modified optimization criteria defined as the smallest numerical value from said step of defining over the set of transmission modes in the subset of transmission modes;

determining optimal values for the dual variables which maximize the modified optimization criteria;

determining a set of transmission modes whose associated numerical values achieve the minimum in the modified optimization criteria, wherein the dual variables are set to optimal values as determined in said step of determining optimal values;

such that the sensitivity value for each link is equal to the optimal value of a respective dual variable determined by said step of determining optimal values for the dual variables.

Therefore, **claim 20 and its dependent claim 24** are considered novel, non-obvious and allowable.

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4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure.

- a. Persson et al. (U.S. Patent # 6067446) disclose Power presetting in a radio communication system.
- b. Persson et al. (U.S. Patent # 6085107) disclose Power presetting in a radio communication system.
- c. Walton, Jr. et al. (U.S. Patent # 5621723) disclose Power control in a CDMA network.
- d. Sindhushayana et al. (U.S. Patent # 6987778 B2) disclose Enhanced channel interleaving for optimized data throughput.
- e. Erving et al. (U.S. Patent # 7139323 B2) disclose Multi-frequency data transmission channel power allocation.
- f. Hostetter et al. (U.S. Patent # 5450395) disclose Code position modulation system and method for multiple user satellite communications.
- g. Vasudevan (U.S. Patent # 7558255 B2) discloses Method of switching modes of uplink transmission in a wireless communication system.
- h. Srikrishna et al. (U.S. Patent Application Publication # 20070201393)

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disclose Regulation of transmission power within a wireless network.

i. Wang et al. (U.S. Patent Application Publication # 20050032541) disclose Method for data transmission rate adaptation.

6. Any response to this Office Action should be **faxed to (571) 273-8300 or mailed to:**

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P.O. Box 1450
Alexandria, VA 22313-1450

Hand-delivered responses should be brought to

Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

7. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Allahyar Kasraian whose telephone number is (571) 270-1772. The Examiner can normally be reached on Monday-Thursday from 8:00 a.m. to 5:00 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Rafael Pérez-Gutiérrez can be reached on (571) 272-7915. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the

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Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or 571-272-4100.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist/customer service whose telephone number is (571) 272-2600.

*/Allahyar Kasraian/
Examiner, Art Unit 2617*

A.K./ak

*/Rafael Pérez-Gutiérrez/
Supervisory Patent Examiner, Art Unit 2617*

July 28, 2009